

New, Renovated or Leased Federal Buildings



Phoenix, AZ

August 3-6, 2008



Fossil Fuel Reduction Goals

EISA: Section 433





Agenda

1. What is in the legislation?
2. What are the targets?
3. Site versus source energy?
4. More efficient designs
5. Renewable energy sources
6. Other issues



SEC. 433. FEDERAL BUILDING ENERGY EFFICIENCY PERFORMANCE STANDARDS.

- For all prospectus level new Federal buildings and major renovations
- The buildings shall be designed so that the fossil fuel-generated energy consumption of the buildings is reduced, as compared to a similar 2003 FY building (as measured by CBECS) by the following percentage:

Fiscal Year	Percentage Reduction
2010.....	55
2015.....	65
2020.....	80
2025.....	90
2030.....	100

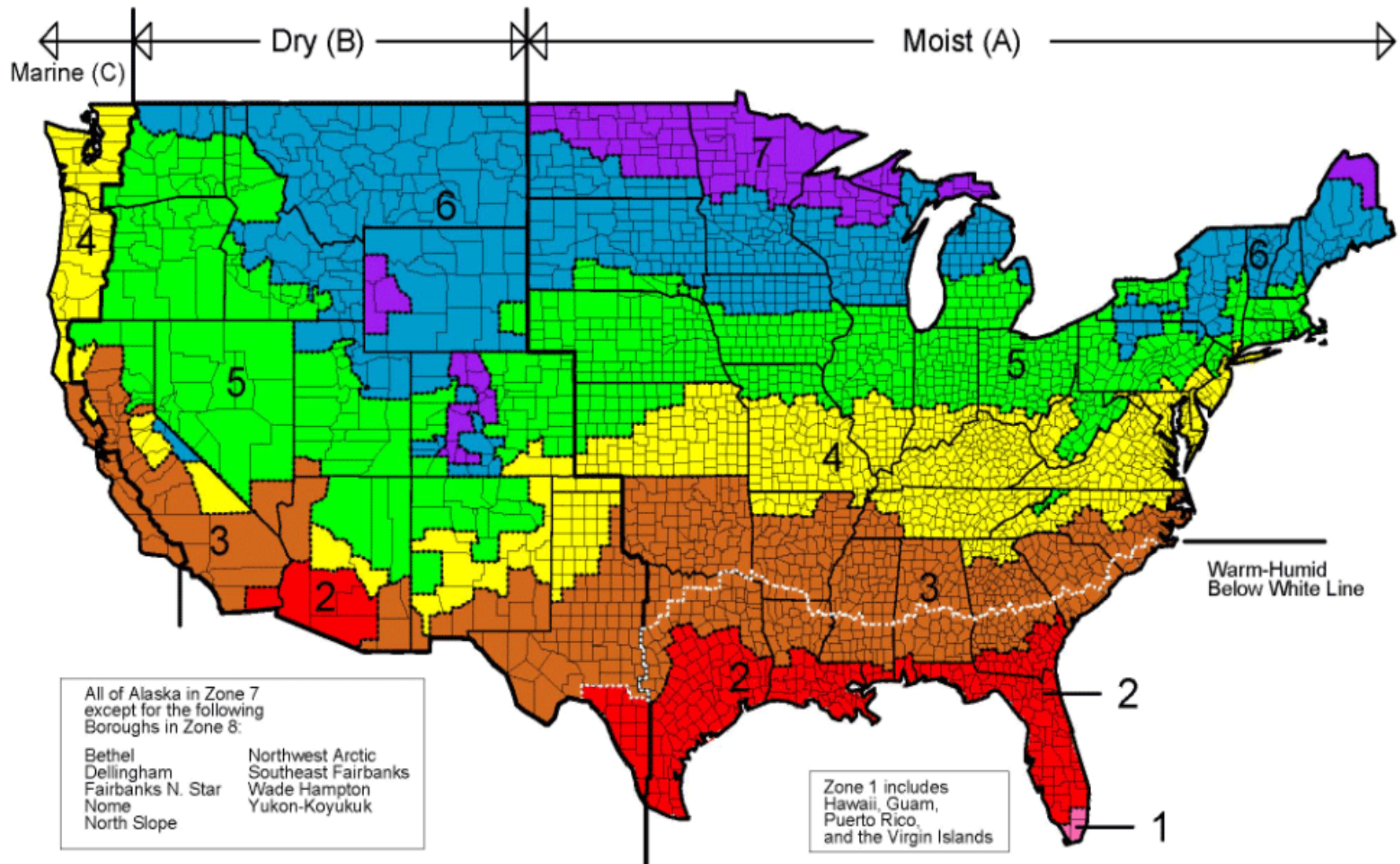


Table 3. 2003 CBECS⁶ Weighted Mean Energy Use Intensities by Subsector and Climate Zone: IP Units kBtu/ft²-yr

Subsectors	Climate Zones														
	All	1A	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	6A	6B	7
All	90	74	72	114	89	70	62	95	108	99	104	87	89	97	71
Office/professional	93	42	82	72	88	70	58	97	143	95	107	66	110	114	68
Nonrefrigerated warehouse	42	22	16		22	21	20	39	29	37	79	60	37	58	33
Education	83	52	73	160	62	74	105	102	38	58	87	79	90	90	84
Retail (except malls)	74	61	93	129	60	50	31	65	100		88	80	93	97	102
Public assembly	94	75	60		112	48	45	110	44	249	103	97	88	102	97
Service	77	60	53		49	61	27	82	83		80	101	88	99	65
Religious worship	44		31		28	31		47	56		52	39	53	34	
Lodging	94	81	91		98	57		92	264	545	89	65	108	93	68
Food services	258	393	208		423	393	82	234		260	258	228	203	236	192
Inpatient health care	249	200	246	360	205	257	204	248	163		294	245	240	235	256
Public order and safety	116		91		160	79		129			108	94	126	148	
Food sales	200		166		212	183	120	242			203	147	242		199
Outpatient health care	95	19	77		55	106		70	190		111	120	112	91	166
Vacant	21		4	47	4	6	0	40	3	60	21	93	22		55
Other	79		48		100	175		71	26		94	92	69	85	57
Skilled nursing	125		71		84	85		148			148	153	118	134	
Laboratory	305				242	170		600			370		268	115	
Refrigerated warehouse	99							120			68	51	62		

⁶ Data source is 2003 CBECS public use microdata as analyzed by Griffith et. al. (2008) (NREL TP-550-41956)



http://www.eere.energy.gov/buildings/highperformance/pdfs/energy_use_intensity_targets.pdf

William Holley

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Reductions for Office Bldg in DC

2003	2008	2010	2015	2020	2025	2030
CBECS	GSA	55%	65%	80%	90%	100%
97	65	44	34	20	10	0
		21 32%	10 23%	14 41%	10 50%	



How to Reduce Fossil Fuel Use

- **Source-Site Ratios (Portfolio Manager fuels)**

- | | |
|---------------------------------------|-------|
| Electricity | 3.340 |
| Natural Gas | 1.047 |
| Fuel Oil (1,2,4,5,6,Diesel, Kerosene) | 1.01 |
| Propane & Liquid Propane | 1.01 |
| District Steam | 1.45 |
| District Hot Water | 1.35 |
| District Chilled Water | 1.05 |

- CBECS data is site energy data
- Until DOE rule is established we are using EPA's Energy Star Target Finder for 2010 prospectus submissions



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Target Finder

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Target Finder



EPA's Target Finder tool helps architects and building owners set aggressive, realistic energy targets and rate a building design's estimated energy use. Use the tool to achieve

Designed to Earn the ENERGY STAR, and participate in the ENERGY STAR Challenge. ([Learn how architects can take the ENERGY STAR Challenge](#)).

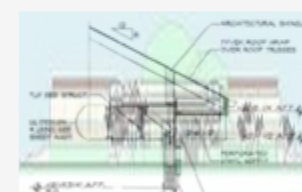
[2003 CBECS National Average Source Energy Use and Performance Comparisons](#) (45KB) provide national energy performance averages

for building types not available for an EPA rating. The results are not normalized for climate, building size, occupancy, or other activities that may affect energy use.

About Target Finder

Target Finder and data from the U.S. Department of Energy (DOE) Energy

2007 Challenge Projects



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Tinker Elementary School Gould Evans Associates, PL

ENERGY STAR Rating: 82

Annual Energy Savings: 1,457,000 kBtu

Annual CO₂ Savings: 310,000 lbs

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Quick Finder

[Portfolio Manager Login](#)



Energy Star Target Finder

- Provides Site and Source Energy based on CBECS data.
- Allows for various building types.
- Energy mix by location
- Recognized data source.



How to Achieve the Energy Targets

1. Design and Build more Efficient Buildings
2. Incorporate Renewable Energy
3. Improve Operations and Maintenance
4. Tenant Involvement

Integrated Management Approach



NZEB by 2025

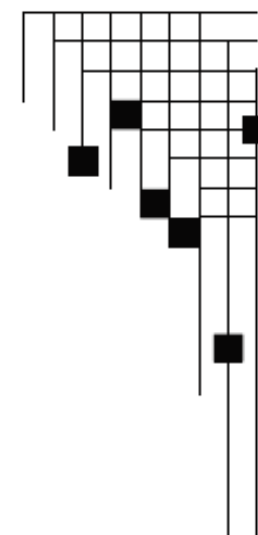
Assessment of the Technical Potential for Achieving Net Zero-Energy Buildings in the Commercial Sector

B. Griffith, N. Long, P. Torcellini, and R. Judkoff
National Renewable Energy Laboratory

D. Crawley and J. Ryan
U.S. Department of Energy

Prepared under Task No. BEC7.1006

Technical Report
NREL/TP-550-41957
December 2007





Potential for Achieving Net Zero Energy Commercial Buildings

Table 4-15 Sector-Wide Average Site EUI by End Use for Various Scenarios

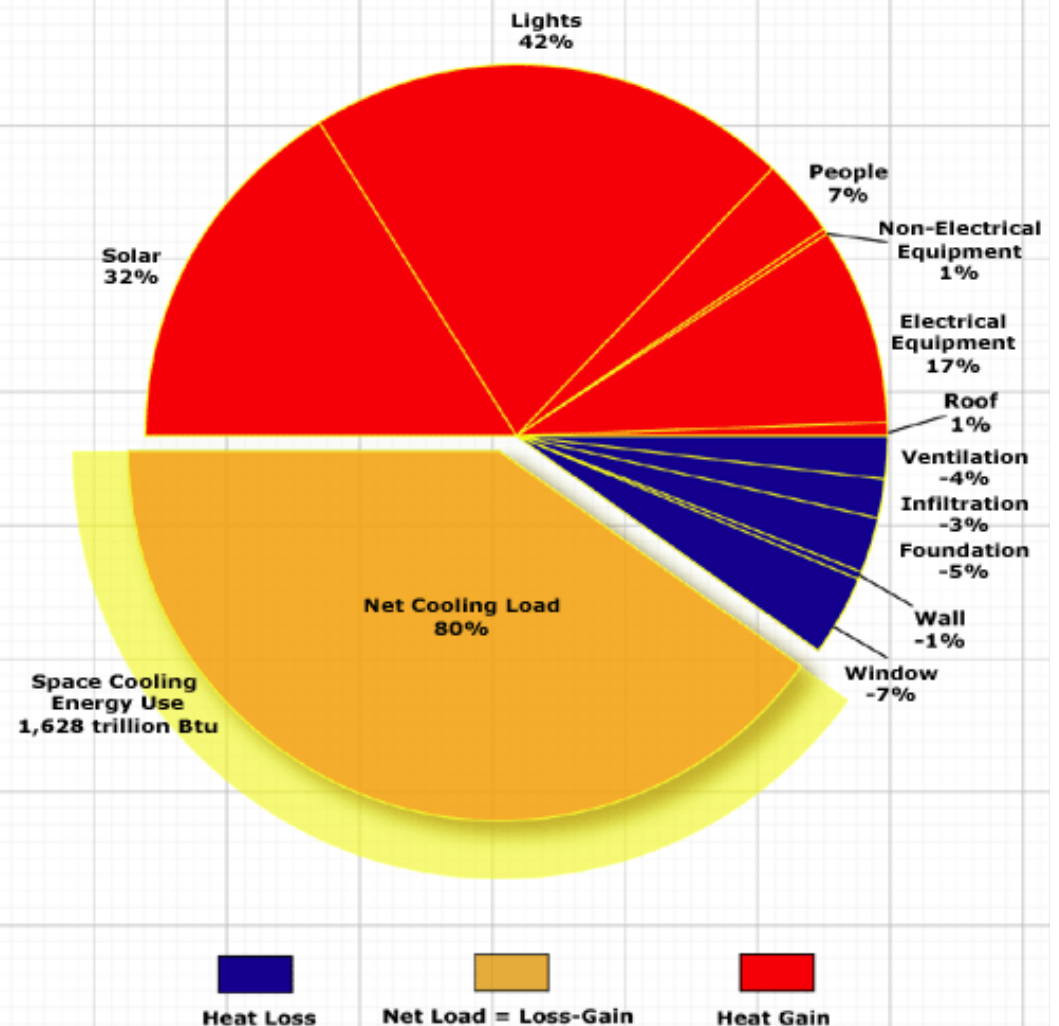
End Use	Base		Max Tech		Percent Savings
	(kBtu/ft ² ·yr)	(MJ/m ² ·yr)	(kBtu/ft ² ·yr)	(MJ/m ² ·yr)	
Lights	12.6	143	4.5	51	64%
Cooling equipment	9.1	103	5.2	59	43%
Heating equipment	17.5	199	5.2	59	70%
Fans	4.6	52	1.7	19	63%
Pumps	0.54	6	0.38	4	30%
Plug/process electricity	10.1	115	10.1	115	0%
Process gas	5.3	60	5.3	60	0%
Refrigeration	4.4	50	3.1	35	30%
Total site	70.7	803	40.3	458	43%
PV production	0.0	0	28.1	319	N/A
Net site	70.7	803	12.2	139	83%



Cooling Mode

- Solar load and Lights nearly match the net cooling load
- Lights and electrical equipment loads are nearly 60% of the cooling load.

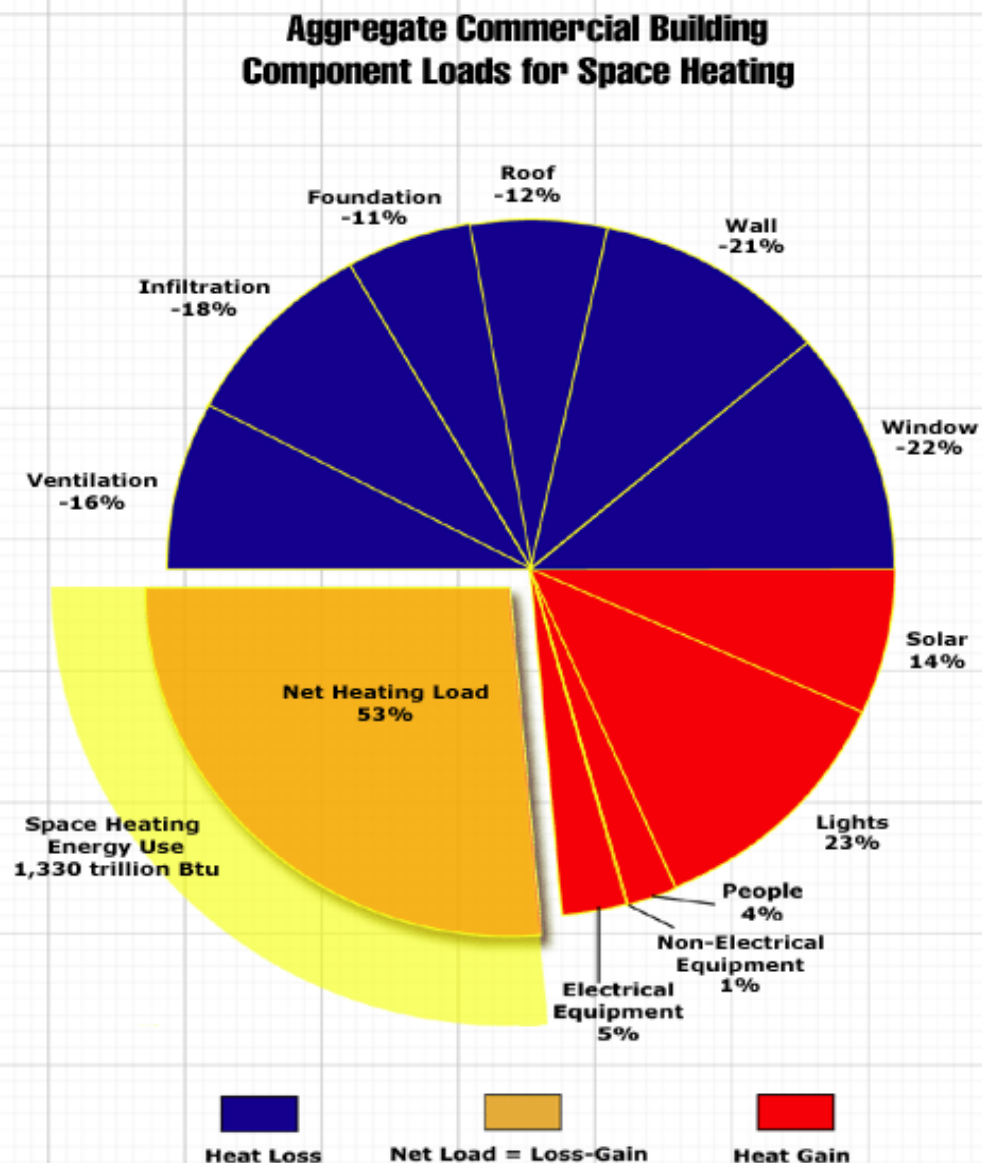
**Aggregate Commercial Building
Component Loads for Space Cooling**



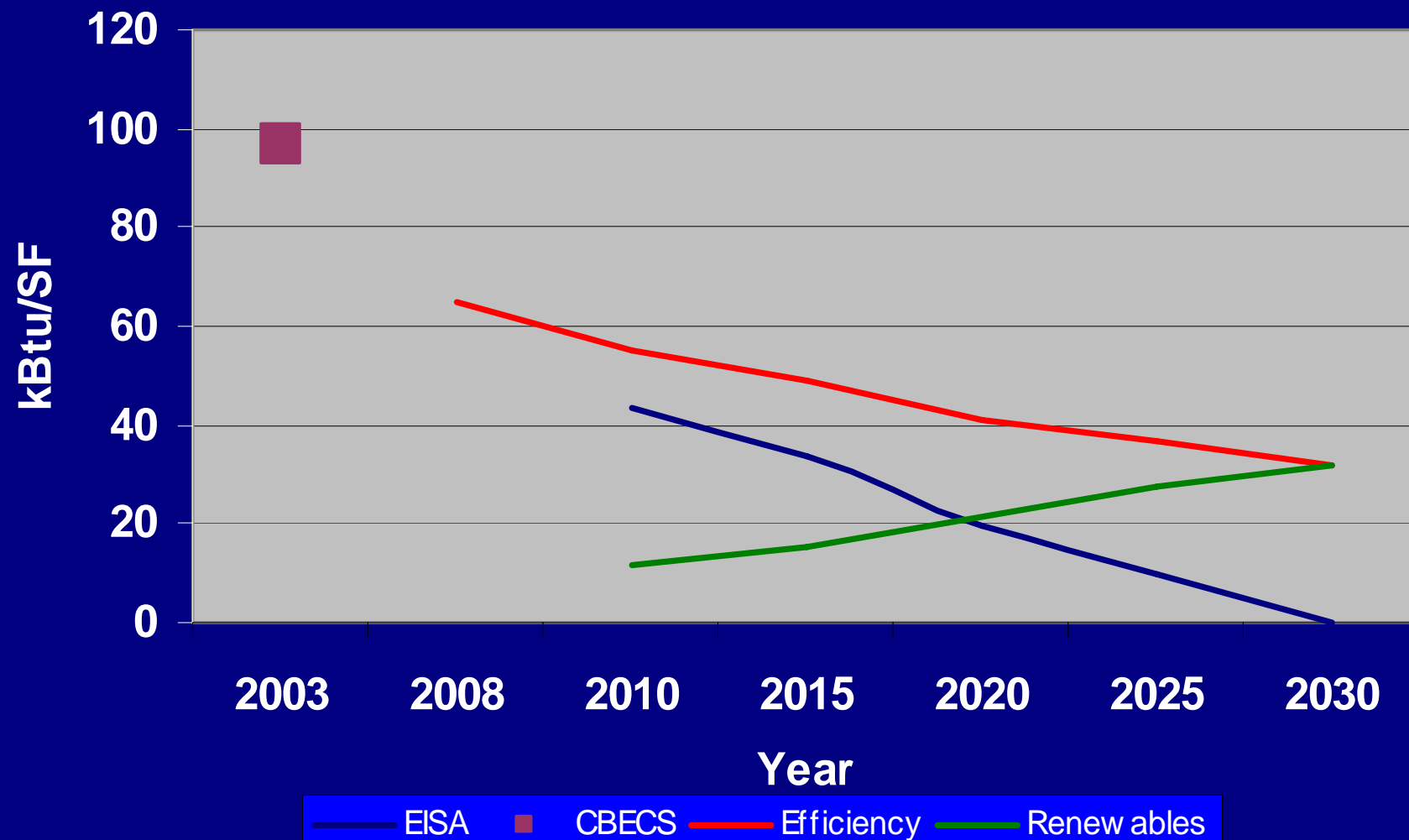


Heating Mode

- Heat gain from lighting is a big part of the gain to the space



Meeting EISA Fossil Fuel Reduction Goals





Renewable Energy

- Solar Hot Water – 30% Mandated
- Photovoltaics – Soft Mandate
- Wind Turbines
- Ground Source Heat Pumps – Soft Mandate
- Bio fuels, Bio gas



Remaining Issues

- How will this apply to major renovations and historic buildings?
- How will source energy goals be set?
- How to address renewable energy for office buildings in urban centers?
- How to budget and fund this requirement?
- Limited expertise in the design community to meet these goals.
- Availability and speed of development of needed energy efficient technologies.



For More Information

Would you like to know more about this session?

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